

12. Exhibits a vertical view of part of the edge of the above slab of *Chætetes hyperboreus*, showing the comparative tenuity of the expansion. About nat. size.
13. A transparent vertical section of *Chætetes hyperboreus*, magnified 7 diameters.
14. A horizontal section of the same coral, $\times 7$ diam.
15. The surface, slightly weathered, of a piece of *Pachypora lamellicornis*, Lindström. From the Wenlock (Upper Silurian), Gotland. Drawn of nat. size from a specimen in the cabinet of Prof. Nicholson.
16. A section in the plane of the frond of part of the same specimen of *P. lamellicornis*, rubbed down and viewed by transmitted light, $\times 4$ diam. Owing to the undulations of the specimen, the section cuts across the corallites obliquely.
17. A section at right angles to the plane of the frond of the same, magnified 4 diam.
18. A superficial view of the surface of a fragment of *Pachypora (Alveolites) Fischeri*, Billings. From the Hamilton group, Middle Devonian, Arkona, Ontario. Encrinital joints are adherent to the surface of the specimen. Of nat. size and sketched from a specimen in Prof. Nicholson's cabinet.
19. A microscopical vertical section of fig. 18, $\times 7$ diam.
20. A segment of a transparent horizontal section of the same, also magnified 7 diameters.
21. *Pachypora (Alveolites) frondosa*, Nicholson. Vertical transparent section, $\times 6$ diam. Specimen obtained from the Hamilton group, Middle Devonian, Arkona, Ontario, and now in Prof. Nicholson's cabinet.
22. A vertical section of the same specimen of *P. frondosa*, also $\times 6$ diameters.

On the Sacral Plexus and Sacral Vertebrae of Lizards. By ST. GEORGE MIVART, Sec. L.S., and the Rev. ROBERT CLARKE, F.L.S.

[Read May 3, 1877.]

(Abstract.)

THE authors mention that of late it has been recognized that, in any attempt to answer the question as to which vertebra of any lower animal answers to the first sacral vertebra of Man, the nervous no less than the osteological relations of the parts should be carefully investigated. And it has been considered that the nervous rather than the osteological relations should be deemed the more important: in fact it has been sometimes asserted that the nerves must be taken as the fixed points, and that the bones must rather have their homology decided by the nerves, than *vice versa*.

Should it be possible to show that in any group of reptiles, both

the nervous and osteological relations of any vertebra constantly agree with the nervous and osteological relation of Man's first sacral vertebra, the homology between such two parts may well be taken as thereby established; but if either of these sets of relations exhibit discrepancy, then of course such homology cannot be considered satisfactorily determined.

Nor can we justly set aside osteological in favour of nervous resemblances if it should turn out that the nerves themselves exhibit notable variations of conditions as we pass from one allied form to another—*a fortiori* if there should be variations in this respect even within the limits of a species. It might surely be anticipated that more or less variation would be found to exist innervous as well as in skeletal structures; and in the event of such anticipations being justified, the determination of sacral homology must depend upon a comparison of the values of the conflicting claims of different degrees of resemblance in both the osseous and nervous systems—unless we prefer to consider the osteological sacrum and the nervous sacrum as two distinct structures, which may or may not completely coincide, and may or may not widely diverge.

The authors afterwards discuss the opinions held by Professor Gegenbaur with regard to the pelvic relations in birds and some reptiles, also those of Professor Hoffmann concerning the lumbar and sacral plexuses of Batrachians and Reptiles.

Then follows an account of dissections of the Chameleon (*Chamaeleo vulgaris*), the Green Lizard (*Lacerta viridis*), the common Teguxin (*Teius teguxin*), the Bearded Lizard (*Grammatophora barbata*), the *Agama colonorum*, the Tuberculated Lizard (*Iguana tuberculata*), and of the Monitor (*M. arenaria*).

On these dissections are based some remarks on the general condition of the nervous and osseous structures of the sacral region in Lizards, according to their views and as compared with those held by Gegenbaur and Hoffmann. To this succeed other chapters devoted to a consideration of the sacral region of Batrachians, to the sacral region of Mammals, and to the sacral region of Birds, each discussed in a similar spirit.

Their generalizations to the foregoing may be thus summarized:—

It appears, then, that in Lizards generally, the lumbar plexus may be formed by from two to three roots, and that the most pre-axial of these is here in advance of the fourth presacral nerve, while the most postaxial root is never more postaxial than the first

presacral nerve. But *Monitor* and *Chamæleo* present a slight exception in certain respects.

In all the Reptilia examined and enumerated by the authors, the transverse processes which abut against the ilium are wholly or in part parapophysial, and are in serial relation (serial homologues) with the capitular processes (or the capitular parts of the transverse processes) of the more preaxial vertebræ. The junction of the sacral vertebræ with the ilium is much postacetabular in Saurians; but in Crocodilia and Tortoises (some at least) it is about opposite the acetabulum.

In Batrachians the transverse processes abutting against the ilium are parapophysial, but diapophysial in nature like those of Reptiles.

In Mammals as compared with Lizards, it would seem, with respect to nerves, that the first and second sacral vertebræ (say, for instance, of the Cat), answer very well to the two vertebræ with enlarged transverse processes of Lizards, while osteologically they of course also answer very well to them. There can be little doubt, however, that the first two sacral vertebræ of the Cat are to be considered homologous with the anterior human sacral vertebræ; and therefore it would seem that the two ilium-joining vertebræ of Lizards should be considered homologous with the anterior human sacral vertebræ.

In Man, the Cat, and also in other Mammals down to the Echidna, the transverse processes abutting against the ilium are parapophysial, like those of Reptiles and Batrachians. In all the Mammals examined by the authors, however, the junction of the sacral transverse processes with the ilia is preacetabular, although that junction is much less preacetabular in position in Man than it is in most Mammals.

Altogether, from the osseous and nervous conditions evinced together in the groups hitherto referred to, the authors propose the following definition of a "Sacral Vertebra" in Mammals, Reptiles, and Batrachians:—"vertebra with parapophysial transverse processes which abut against the ilium, preaxial or postaxial or opposite to the acetabulum, and having a root of the sciatic plexus coming forth either immediately preaxial or postaxial of it."

This definition will exclude from the sacrum, as not abutting against the ilium, of Man, the more posterior vertebræ called "sacral" in anthropotomy. But in the lower mammals (even already in Apes) the number of so-called "sacral" vertebræ aug-

ments more or less with age by the ankylosis of the sacral vertebræ, so as not to render the extent of the "sacrum" very variable. It would surely be well, then, to distinguish the human sacral vertebræ, like the ribs, into true and false, those being the true sacral vertebræ which abut against the ilium.

In Birds the determination of the homological relations of the different parts of the postdorsal part of the spinal column is a matter of much difficulty. On the whole, and seeing on the one hand the manifest homology between the sacral vertebræ of Man and Lizards by the help of Crocodiles and Tortoises, and on the other hand the manifest homology between the sacral vertebræ of Lizards and the posterior parapophysial vertebræ of most Birds, the authors think it better to regard the latter vertebræ in Birds as alone truly sacral, and to regard such forms as *Buceros*, *Pica*, and certain Parrots as differing from the rule of the Class in the suppression of their parapophysial processes, and *Fregatta* as differing from the same rule by the development of parapophyses in all the vertebræ of this region.

The sacral vertebræ in Birds may be defined, then, as "*vertebræ having one of the more postaxial roots of the sciatic plexus coming forth either immediately preaxiad or postaxiad, and having parapophysial transverse processes abutting against the ilium, such vertebræ being placed immediately postaxiad to vertebræ which are devoid of such parapophyses, or else being the homologues of a vertebra so conditioned in most birds.*"

By the combination of these two definitions, as given above (the one for Mammals, Reptiles, and Batrachians, and the other for Birds), it seems to the authors that the sacral vertebræ may be defined in all Vertebrata above Fishes which have pelvic limbs.

On the Nymph-stage of the *Embidæ*, with notes on the Habits of the Family, &c. By R. M'LACHLAN, Esq., F.R.S., F.L.S., &c.

[Read June 7, 1877.]

(PLATE XXI.)

Introductory Remarks.

IN the year 1837 Prof. Westwood published in the 'Transactions' of this Society (vol. xvii. pp. 369-375, pl. xi.) a memoir entitled "Characters of *Embia*, a Genus of Insects allied to the White Ants; with descriptions of the species of which it is composed," wherein he gave a résumé of the little hitherto known concerning